NOVASwitch

FNSW-1600S

FNSW-2400S

10/100Base-TX

Fast Ethernet Smart Switch

Trademarks

Copyright © PLANET Technology Corp. 2000.
Contents subject to revision without prior notice.
PLANET is a registered trademark of PLANET Technology Corp. All other trademarks belong to their respective owners.

FCC Warning

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the Instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Revision

PLANET NOVASwitch User's Manual
FOR MODELS:
FNSW-2400S
FNSW-1600S
Part No.: EM_FNSWSV1

Before Starting

In this User's Manual, "Switch" is used for FNSW-1600S/2400S, "NovaSwitch" for PLANET's 19"-range Ethernet Switch, where "switch" represent the third part switch. The term "port 16/24" or "port 12/20" represent port 16 or 12 of FNSW-1600S and port 24 or 20 of FNSW-2400S.

TABLE OF CONTENTS

1.UNPACKING INFORMATION

Thank you for purchasing a PLANET NOVASwitch series Ethernet Switches. Before continuing, please check the contents of the product package. This product package should contain the following items:

- One NOVASwitch Ethernet Switch
- One Power Cord
- Two Rack-Mounting Brackets with Attachment Screws
- This User's Guide
- RS-232 Console Cable

Please inform your local dealer/supplier immediately if any item is found to be defective, damaged or missing. Retain the original packaging (carton), including the packing materials, and use them to re-pack the product in the unlikely event there is a need to return it to us for repair.

.

This page intentionally left blank!

2.PRODUCT INTRODUCTION

NOVASwitch Ethernet Switches are multi-speed, versatile network devices combining both standard and "Big-Pipe" ports under the same hood.

2.1 Key Features

- Compliant with IEEE802.3 and 802.3u standards for 10Base-T / 100Base-TX/FX.

- 16-port/24-port Fast Ethernet Switch, pure 10/100Base-TX

- Wire-speed "Store-and-Forward" filtering/forwarding eliminates bad data packets with minimal delay

- 100Base-TX ports automatically sense and set optimal line speed from 10/20, 100/200Mbps, All 100Base-TX port support MII Auto-Negotiation function

- Optional Fiber-optic module for 100Base-FX, shared with port16/24. DIP switch for Half/Full-Duplex selection

- Shared buffer memory and up to 2K-entry MAC source address table make for fast handling of data packets

- Flow control to eliminate packets loss

- Internal, full-range power supply suitable for worldwide use

- Console port for switch basic management

- Either VLAN or Turnk port support managed via console

- Up to four port-based VLAN support

- Up to four trunk support for up to 800Mbps bandwidth
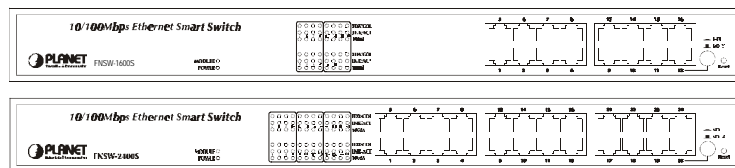
- One Redundant link support

2.2 Front Panel

Figure 1: Front View of the FNSW-16/2400S

2.2.1 Ports Speed

■ **100Base-TX**

All 100Base-TX ports come with auto-negotiation capability. They automatically support 100Base-TX and 10Base-T networks. Users only need to plug a working network device into one of the 100Base-TX ports, then turn on the hub. The port will automatically runs in 10Mbps, 20Mbps, 100Mbps or 200Mbps after the negotiation with the connected device. Port speed adjustment is also available through console port.

■ **100Base-FX**

The port 16/24 can be a 100Base-FX fiber-optic port as the extension module installed (rear) At the mean time, the RJ-45 port of #16/24 will being disabled. The Half-/Full-Duplex is selectable by the DIP-switch on the module. Please refer to the installation guide of the extension module for more.

2.2.2 Cabling

NOVASwitch 100Base-TX ports use RJ-45 sockets -- similar to phone jacks -- for connection of unshielded twisted-pair cable (UTP). The IEEE 802.3u Fast Ethernet standard *requires* Category 5 UTP for 100Mbps 100Base-TX. 10Base-T networks can use Cat.3, 4, or 5 UTP (see table A below)

Port Type	Cable Type	Connector
10Base-T	Cat 3, 4, 5	RJ-45
100Base-TX	Cat.5 UTP only	RJ-45
100Base-FX*	62.5/125μm multi-mode fiber	ST / SC

Table A: Supported port list

2.2.3 MDI Switch
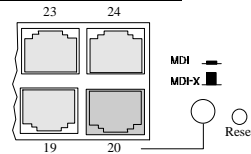
Each numbered port of the Switch are MDI-X port, you can direct use straight cable for the connection to your end nodes. However, port 12/20 is with one push button. To push the button to convert the port to MDI-II port for direct hub cascade. Please also refer to Section "RJ-45 Pin Assignment" for more.

2.2.4 Status LEDs

One green LED to show power On/Off is on the front panel, and one "Module Installed" LED indicator to indicate the rear open slot is installed with a fiber-optic module. Also, each port has three status LED indicators, as shown below.

LABEL	STATUS / COLOR	MEANING	DESCRIPTION
UPPER ROW	*Steady Amber*	FDX	Lit to indicate **Full-Duplex** mode detected on that port
	Blink Amber	COL	Blinks if a **collision** is detected when the port is in Half-Duplex mode.
MIDDLE ROW	*Steady Green*	Link	Lit to indicate that a valid *physical* UTP/STP connection is detected
	Blink Green	Activity	Blink to indicate the port is receiving data packets

| LOWER ROW | Steady Green | 100M | Lit to indicate that a valid *physical* UTP/STP connection exists on that port runs in **100Mbps** |
| | OFF | 10M | Remains off and Link ON to indicate the port runs in 10Mbps |

Table B: FNSW-2400S Port-LED Functions

2.3 The Rear Panel

Figure 2: Rear View of the Switch

2.3.1 Extension Slot

The Switch port 16/24 can be a 100Base-FX switching port as the extension module installed. As the module installed, the port 16/24 on the front panel will be disabled.

Please refer to the Installation Guide of the module for the detailed installation and settings.

> *NOTE: While powering on, The Switch detects the DIP-switch status of the module, then shown on the front panel LED indicators*

2.3.2 Power Connector

The Power Connector is designed to use with the power cord included in the product package. Attach the female end of the cord to the power connector and the male end of the cord to a grounded power outlet. The accepted power range is from 100VAC to 240VAC, 50/60Hz.

2.3.3 Fan

All computing and communications devices work best when not overheated. Please keep the fan area clear so that the cooling function is not impaired.

2.3.4 RS-232 Console

The RS-232 console helps to manage the Switch. Please use the cable with the package. Attach one end to the switch and the other to your PC's COM1 or COM2. Then startup your console program like Windows Hyper Terminal, or ProCOMM with parameter: 19200, n, 8, 1. Please refer to Chapter 4, Console management for more.

This page intentionally left blank!

3. INSTALLATION

The Switch do NOT require software configuration. Users can immediately use any of the features of this product simply by attaching the cables and turning on the power. However, the Console port will helps to have more setting to your Switch.

To get the best use of the Switch, many things need to be considered first. See Chapter 5 for details.

3.1 Rack-Mount Installation

Most users prefer to attach the power cord to the hub before installation in a network rack. Do not plug the other end of the cord into a power outlet until after the hub is installed.

For mounting the Switch in a network rack, first attach the rack-mount brackets to the side of the hub with screws. (Both brackets and screws are included in the product package.) Slide the hub into the rack and align the holes in the bracket with the corresponding holes in the network rack. Attach the bracket to the rack with the enclosed screws.

3.2 Desktop Installation

To locate the Switch on a desktop, first attach the four rubber feet to the bottom of the hub, one in each corner. Place the hub on a clean, flat desk or table-top close to a power outlet. Make sure there is no hindrance behind the fan of the hub

Plug in all network connections, then turn the switch on via plug in the power cord.

3.3 Power notes:

1. The device is a power-required device, it means, it will not work till it is powered. If your networks should active all the time, please consider use an UPS (Uninterrupted Power Supply) for your device. It will prevent you from network data loss or network downtime.

2. In some area, installing a surge suppression device may also help to protect your hub from being damaged by unregulated surge or current to the Switch or the power adapter.

4.CONSOLE CONFIGURATION

On the rear panel, there is one console port for configuring the switch. The attached cable in the packing box is used to connect to PC's RS232C port (COM1, or COM2). Following the instructions below to configure the switch.

4.1 CONNECT TO PC

RS-232 serial cable
> Attach the RS-232 cable 9-pin female connector to the male connector on the demo board. Plug the other side of this cable to your PC.

Hyper Terminal
> In Window 95/98, launch "HyperTerminal", create a new connection and adjust setting as below:
> | | |
> |---|---|
> | Baud Rate: | 19200bps |
> | Data byte: | 8 bits |
> | Parity check: | None |
> | Stop bit: | 1 |
> | Flow Control: | No |

Console Menu
> Launch the new terminal you just set up, and then, turn on the Switch. See the following messages for successful connection.

```
PLANET FNSW-2400S Ethernet Smart Switch
Console Menu Rev. v.100
(1)Trunk/VLAN Setting
(2)Port Status
(3)Port Setting
(4)Factory Setting
(5)Redundant Link
(6)Save Setting

Select: (1-6)>>
```

There are six options available for the console setup:

    (1) Trunk / VLAN Setting
    (2) Port Status
    (3) Port Setting
    (4) Factory Setting
    (5) Redundant Link
    (6) Save Setting

To enter any of the sub-menu, simply follow the instruction and type the number on the command line, and press ENTER.

4.2 Trunk/ VLAN Setting

Entry:

Select "1" from <Console Menu>

```
(1) Trunking (2) VLAN Setting (3) Exit >>
```

Purpose:

Set up the TRUNKING or VLAN Group

Be noted: the Switch support either TRUNKING or VLAN. As soon as one is enabled, it also means the other is turned off at the mean time.

Default:

No Trunking or VLAN Group in the device

.

4.2.1 Trunking Group Setting

Entry:

Select "1" from Sub Menu, press "ENTER"

```
4-port Trunk on Port 1/2/3/4
2-Port Trunk on Port 1/2
SWITCH in 1-VLAN mode
Trunk (1) Disable (2)2-Port (3)4-Port (4)Cancel Setting>>
```

Purpose:

Assign Trunk group setting option.

Default:
    No Trunk Group in the device.

Note:
    As soon as trunk port enabled, the ports will be grouped as
    followings:
    2-port Trunk:
    1st group: **1**, 3, 5, 7, 9, 11, 13, 15, 17, 21, 23
    2nd group: **2**, 4, 6, 8, 10, 12, 14, 16, 18, 19, 20, 22, 24

    4-port Trunk:
    1st: **1**, 5, 9, 13, 17, 21
    2nd: **2**, 6, 10, 14, 18, 22
    3rd: **3**, 7, 11, 15, 19, 23
    4th: **4**, 8, 12, 16, 20, 24

Once trunk-port enabled, your are free to connect the Switch to any 3rd
party's standard switch with two links or four links without fears of
network looping. The trunks will two or four times the bandwidth
between the Switch to the connected switch.

After trunk-port enabled, please make the links directly and be sure to
make the connection successfully or the group users may fail to
access the network resource.
Note:
    Please make sure the switch that your Smart Switch is going to
    connect to is "Trunking" disabled. That is, either the Smart Switch
    or any 3rd party switch can turn on the "trunking" at a time.

4.2.2 VLAN Group Setting

   Entry:

   Select "2" from sub menu, press "ENTER"

```
PORT   01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
VLAN1   X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X
VLAN2
VLAN3
VLAN4
(1)Set VLAN(2)Save/Exit(3)Exit>>
```

Purpose:

Set up the VLAN Group

Default:

No VLAN Group in the device (all ports in VLAN1)

Note: Use Toggle to select VLAN group and "SAVE" to make the setting take effect.

VLAN setting example 1,

Follow the selection to add port 1 to VLAN2.

```
Enter Port# >> 1

Toggle Group(1~4) to add/remove (5)Update VLAN setting >>2
Toggle Group(1~4) to add/remove (5)Update VLAN setting >>5
```

The restult is as below:

```
PORT   01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
VLAN1   X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X
VLAN2   x
VLAN3
VLAN4
(1)Set VLAN(2)Save/Exit(3)Exit>>
```

Follow the steps again to add the VLAN groups.

VLAN Setting Example 2

Add port 5 to the four VLANs to maks it server for those VLANs.

```
(1)Set VLAN(2)Save/Exit(3)Exit>> 1
Enter Port# >> 5

Toggle Group(1~4) to add/remove (5)Update VLAN setting >>2
Toggle Group(1~4) to add/remove (5)Update VLAN setting >>3
Toggle Group(1~4) to add/remove (5)Update VLAN setting >>4
Toggle Group(1~4) to add/remove (5)Update VLAN setting >>5
```

With the setting below, the Switch will separate port 1 to port 4 into 4 VLANs, i.e. those ports can not reach each other. However, they can still access port 5 without problem.

```
PORT   01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
VLAN1   X           X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X
VLAN2      X        X
```

PLANET NOVASwitch series

```
VLAN3          X      X
VLAN4             X  X
```

4.3 Port Status

Entry:
Select "2" from < Console Manu>

```
PORT   01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
AutoN  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X
BackP  X  X  X  X  X  X  X  X  X     X  X  X  X  X  X  X  X  X  X  X  X  X  X
Pause  X     X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X  X

SWITCH in 1-VLAN mode

Any key to quit!!
```

Purpose:
Display the Port Status group

AutoN for "Auto-Negotiaion", BackP for "Back Pressure", half-duplex flow control. Pause for "Pause frame" stands for full-duplex flow control.

4.4 Port Setting

Entry:
Select "3" port setting, press "ENTER"

```
Enter Port Number
```

Purpose:
Set up the port setting group

Port Setting chart example 1

Set port 1 to works in 100Mbps Full-Duplex mode

```
Enetr Port Number ((qq) to quit)>> 1

Select (1)Port Mode (2)Pause (3)Back Pressure>>1
Select (1)Auto_Nego (2)100FDX (3)100HDX (4)10FDX (5)10HDX>>2
```

Port Setting chart example 2

Enable port 2's PAUSE frame support

```
Enetr Port Number ((qq) to quit)>> 2

Select (1)Port Mode (2)Pause (3)Back Pressure>>2
Select Pause in FDX (1)Enable (2)Disable>>1
```

PAUSE frame is used while the devices that connect to the Switch runs in Full-duple mode. In full-duplex mode, once the Switch can not handle the incoming packets, the Switch send out the PAUSE frame to warn the device hold the transmission. Be noted, the connected devices should also support the function at the same time or to enable the capability will not helps in avoid packet loss.

Default: Enabled per port

Port Setting chart example 3

Enable port 3's Back-pressure.

```
Enetr Port Number ((qq) to quit)>> 3

Select (1)Port Mode (2)Pause (3)Back Pressure>>3
Select Back Pressure in HDX (1)Enable (2)Disable>>1
```

When a half-duplex device was not able to handle the amount of data it was receiving from an end station, it collided with it (faked a collision by sourcing JAM). Thus all devices on the shared LAN would have to back-off, and then try to retransmit. The device could keep on colliding, so the other end station won't loss its packets.

Default: Enabled per port

4.5 Factory Setting

Entry:
Select "4" from < Console Manu>

Purpose:

Set up the Factory default value, the system will be Auto Reboot

4.6 Redundant Link Setting

Entry:
Select "5" from < Console Manu>

```
Redundant Link on Port-20/Port-19(19 is Backup link)
(1)Enable (2)Disable >>1
```

Purpose:
Set up Redundant Link. So the backup line enabled once the primary line is absent.

4.7 Save Setting

Entry:
Select "6" from < Console Manu>

Purpose:
Set up the Save Setting, save the setting to EEPROM.

This page intentionally left blank!

5.OPTIMIZING CONFIGURATION

5.1 Prior to Installation

Before installing the Switch and connecting network devices, it is important to plan the new network layout. Consider:

- **_Dedicated Bandwidth:_** File servers and other high-traffic hardware can improve if they have their own direct connection with dedicated 10 or 100Mbps bandwidth.
- **_Full-Duplex:_** Determine which devices would benefit from a Full Duplex connection and check that they support it.
- **_Fast Ethernet:_** 100Base-TX and 100Base-FX have different rules for cable and distance. Make sure these are followed.
- **_Auto-Negotiation:_** Devices with different speeds may be easily swapped when the other end of the cable is fixed to a port with auto-negotiation.
- **_Crossover Uplink:_** Another hub can be attached to Switch using UTP Crossover function.

5.2 Half- and Full-Duplex

The Switch support both Half- and Full-Duplex modes for 10Base-T, 100Base-TX, and 100Base-FX. Half-Duplex mode is the traditional data transfer mode: one station sends data while other devices wait for the first to finish.

Full-Duplex is the simultaneous transmission and receiving of data. It is only possible between two devices with a dedicated link (e.g., switch-to-switch, switch-to-PC). Both of the devices must be capable of, and set to, Full-Duplex

The 100Base-FX port set Half- or Full-Duplex mode through module's DIP-switch. 100Base-TX ports use auto-negotiation to detect and set the line's operating mode.

5.3 Fast Ethernet

100Base-TX and 100Base-FX are called "Fast Ethernet." This is because they use the Ethernet CSMA/CD access rules and data packet structure, but data travels ten times faster (100Mbps) than traditional 10Mbps Ethernet.

Below is a list of the cable types and connectors that supported by Switch for 10Base-T, 100Base-TX, and 100Base-FX networks.

PORT TYPE	CABLES TYPE	CONNECTOR
100BASE-TX	Cat. 5 UTP only	RJ-45
10BASE-T	Cat.3, 4, 5 UTP	RJ-45

Table C: Cables & Connectors Supported by FNSW-2400S

In many cases, 10Base-T LANs can quickly and easily upgrade to 100Base-TX networks. Also, 100Base-FX will become more popular due to its longer range. Table lists the maximum Fast Ethernet connection distances.

MAX. LINK DISTANCE	COPPER	COPPER+FIBER[2]	FIBER
DTE-DTE[1]	100m	n/a	412m/2,000m[4]
1 Class-I Repeater[3]	200m	261m	272m
1 Class-II Repeater	200m	309m	318m
2 Class-II Repeaters	205m	216m	228m

NOTES: 1) "DTE" is an end-station such as a PC or switch port
2) Copper+Fiber assumes the max. Copper length is used
3) "Repeater" is a standard hub, NOT a Switch.
4) Half-/Full-Duplex. Fiber's distance depends on mode.

Table D: 100Base-TX/FX Topology Rules

5.4 Auto-Negotiation

The 100Base-TX ports on the Switch have built-in "Auto-Negotiation". This technology automatically sets the best possible bandwidth when a connection is established with another network device (usually at Power On or Reset). This is done by detect the mode and speed at the second device is capable of. The 100Base-TX devices can connect with the 100Base-TX port in either Half- or Full-Duplex mode.

If attached device is:	100Base-TX port will set to:
100Mbps, no auto-negotiation	100Mbps (100Base-TX, Half-Duplex)
100Mbps, with auto-negotiation	200Mbps (100Base-TX, Full-Duplex)
10Mbps, no auto-negotiation	10Mbps (10Base-T, Half-Duplex)
10Mbps, with auto-negotiation	20Mbps (10Base-T, Full-Duplex)

5.5 MAC Address Table

This 6-byte ID is called the MAC (Media Access Control) Address. Every Ethernet data packet includes both source and destination addresses.

The Switch can automatically learn and store up to 2K MAC addresses. The MAC address table is volatile: it disappears when the switch is powered off or reset.

> **Note:** When the network needs reconfiguration, we recommend turning off the power first. After all nodes have been moved, power on the switch to rebuild the internal MAC address table.

5.6 Sample Application

The optimal application for the Switch, no matter with the extension module or not, is as a "big pipe" backbone interconnecting file servers with bandwidth-hungry workgroups, departments, and offices.

In the figure, the first FNSW-2400S links to another switch's Uplink (MDI-II) port, some ports connect to 100Mbps Workstations, and attached to file servers at 200Mbps. This example highlight the extra distance provided by 100Base-FX fiber-optic, using the Port #24 of FNSW-2400S with the rear module installed.
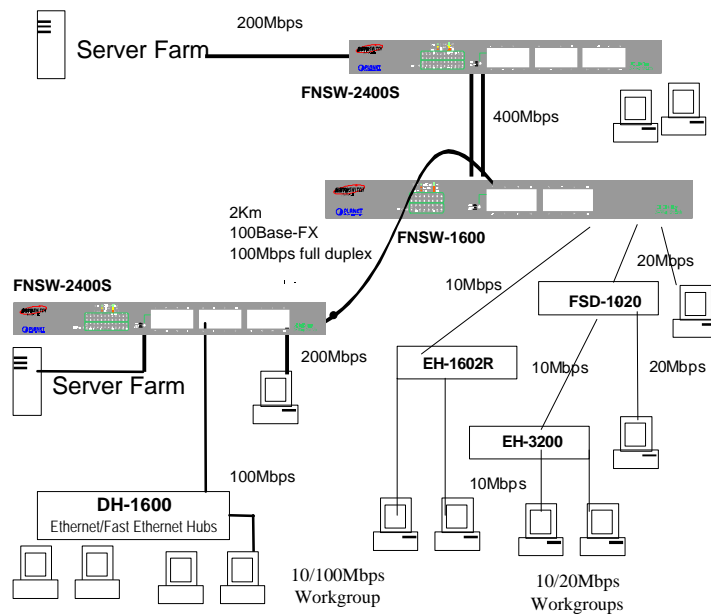

Figure 3: Sample Application for the Switch with Turnk

6.TROUBLESHOOTING

SYMPTOM   Link LED does not lit after cable is connected to the port.

CHECKPOINT   ✔ Verify that the other end of the cable is connected to a device that is powered on and on-line.

  ✔ For UTP cable connection to another hub, verify that only one end of the cable is connected to a "MDI-II" Uplink port.

SYMPTOM   100Base-TX port Link LED is lit, Collision LED is blinking, but traffic is irregular.

CHECKPOINT   ✔ Check that the attached device is not set to dedicated full-duplex. (Some devices use a physical or software switch to change duplex modes. Auto-negotiation may not recognize this type of full-duplex setting.

SYMPTOM   After setting the DIP-switch of the 100Base-FX module, the attached device doesn't communicate normally with the port.

CHECKPOINT   ✔ The attached network device MUST be set to operate in the same duplex mode.

ALWAYS CHECK THAT THE CABLE, LINK DISTANCES, AND OVERALL NETWORK DIAMETER ARE WITHIN SPEC. FOR THE NETWORK TYPE.

This page intentionally left blank!

7.PRODUCT SPECIFICATIONS

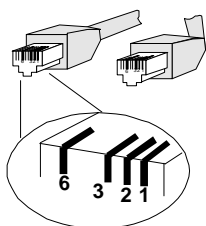| PRODUCT	**FNSW-1600S / FNSW-2400S**
NETWORK PORTS	16/24 10/100Base-TX RJ-45 (MDI-X)
BUFFER MEMORY	4Mb
EXTENSION SLOT	1 open slot (shared with port 16/24 for optional module)
MEDIA SUPPORT	100Base-TX Cat. 5 UTP, RJ-45 10Base-T Cat. 3, 4, 5 UTP RJ-45
BANDWIDTH	100Base-TX, 200/100/20/10Mbps, Auto-Negotiation
FILTER/ FORWARD RATE	148,800 packets/second per port @ 100Mbps, max. 14,880 packets/second per port @ 10Mbps, max.
MAC ADDRESSES	Up to 2K 6-Byte full MAC address entries max. Self-learning
SWITCHES	1 for MDI-X / MDI-II selection for port 12/20
LEDs	1 for Power On/Off, Module Installed 3 per port for 100Mbps, Full-Duplex/ Collision, Act/Link,
POWER SUPPLY	Auto-switching. Input voltage: 100~240 VAC, 50 ~ 60Hz
ENVIRONMENT	*Operating* Temp: 0 ~ 50°C (32 ~ 122°F) *Storage* Temp: -30 ~ 70°C (-22 ~ 158°F) *Humidity* 0 ~ 90% non-condensing
DIMENSIONS	430 x 180 x 44 mm (16.9 x 7.1 x 1.73 in.)
EMISSION	FCC Class A, CE
SAFETY	UL, TUV/GS (EN60950)

Table E: Product Specifications

8. RJ-45 PIN ASSIGNMENT

Pin	Numbered Ports (MDI-X port)	Uplink Port (MDI-II port)
1	Input Receive Data +	Output Transmit Data+
2	Input Receive Data -	Output Transmit Data-
3	Output Transmit Data+	Input Receive Data +
6	Output Transmit Data-	Input Receive Data -
4,5,7,8	Not used	Not used

Schematics for both straight and crossover twisted-pair cable are shown below. (Note that crossover cable is only required if you cascade hubs via the RJ-45 station ports; i.e. the Uplink port is not used.)

8.1 Straight-Through/Crossover Cable

The pin assignment of the cables both ends should be as below:

Straight-through		Crossover	
Hub (MDI-X)	Adapter(MDI-II)	Hub (MDI-X)	Hub (MDI-X)
Pin 1	Pin 1	Pin 1	Pin 3
Pin 2	Pin 2	Pin 2	Pin 6
Pin 3	Pin 3	Pin 3	Pin 1
Pin 6	Pin 6	Pin 6	Pin 2

EMFNSWSv1 $C\epsilon$ **ISO9002**